DOCUMENT RESUME

ED 055 837 SE 012 435

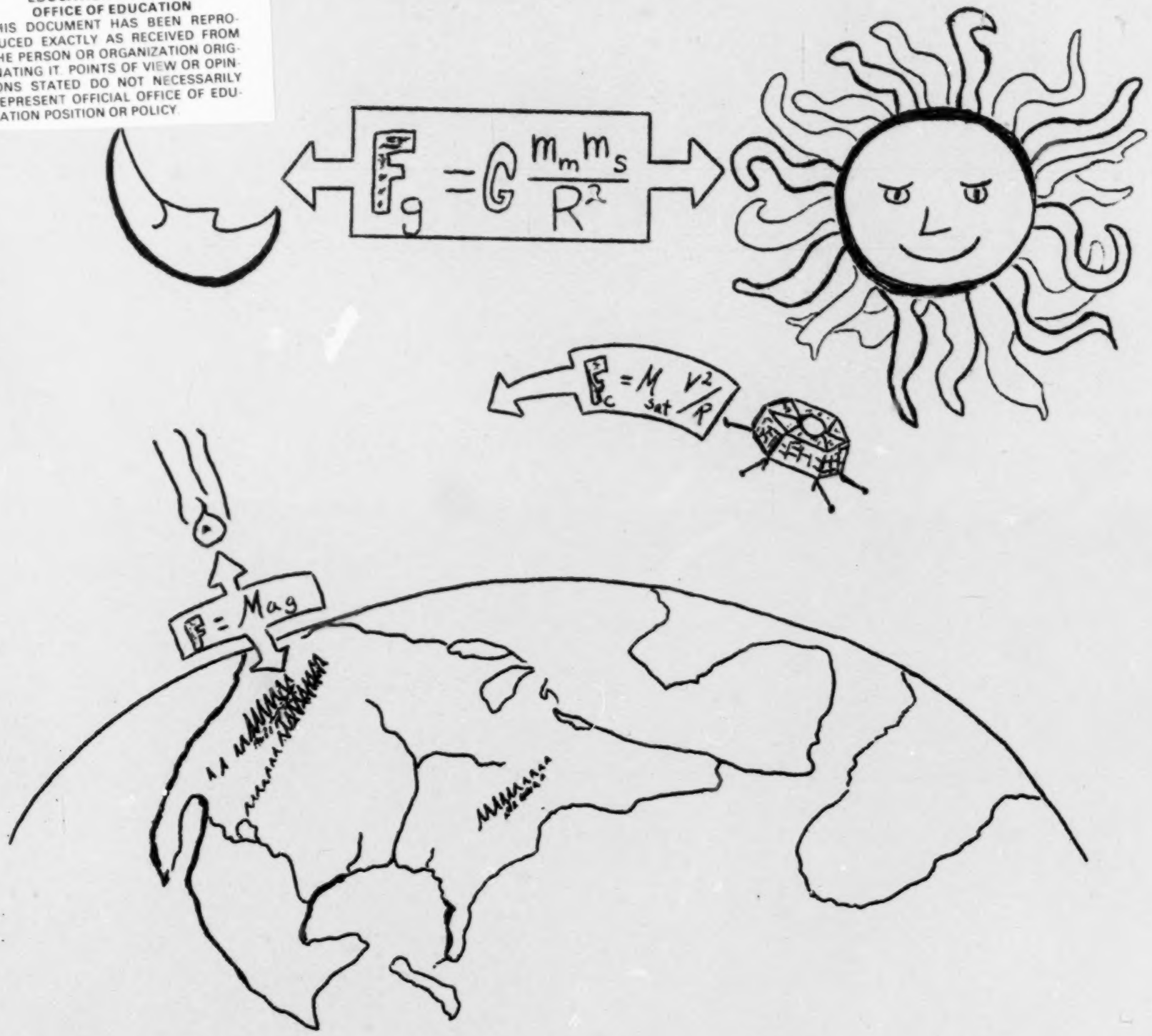
AUTHOR	Payne, John G.
TITLE	Physics Just for Fun--An Individualized Course Using Harvard Project Physics.
PUB DATE	Feb 71
NOTE	8p.; Paper presented at the American Association of Physics Teachers Meeting, February 1971, New York
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Course Organization; *Curriculum Development; *Individualized Programs; Objectives; *Physics; *Secondary School Science; Teaching Methods
IDENTIFIERS	Harvard Project Physics

ABSTRACT

The development of an individualized course at Plano High School, Texas, is described. The first attempt, using only suggested guidelines, was considered unsuccessful. The second structure adopted included: (1) specific, measurable behavioral objectives, (2) both basic and advanced required assignments, (3) tests to measure achievement of the objectives, (4) lists of school resources, and (5) a time table for minimum satisfactory progress. Advantages to the student, teacher and administration are listed along with a discussion of several problems. The present approach involves the class progressing through the course at a single pace prescribed by the teacher. Some time for independent work allows for different levels of performance within this framework. (Author/TS)

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

ED055837



PHYSICS JUST FOR FUN --

An Individualized Course Using Harvard Project Physics

By

John G. Payne
Physics Teacher
Plano High School
Plano, Texas

February, 1971

SE 012 435

PHYSICS JUST FOR FUN--AN INDIVIDUALIZED COURSE USING HARVARD PROJECT PHYSICS*

by

John G. Payne

It is our philosophy at Plano High School that physics should be an enjoyable opportunity for each student, working as independently as possible, to discover and understand physical phenomena to the limit of his interest and ability. Toward this end, we have endeavored to find a workable approach combining the right amounts of fun and independence with the right amounts of student responsibility and class structure. This proper combination has proved to be an elusive goal, but one we have continued to pursue with, we feel, some success. The text and lab materials used are those of Harvard Project Physics, a modern, humanistic physics curriculum developed and tested over the past several years at Harvard University. We find both the philosophy of the course and its wealth of multi-media learning materials ideally suited to our purpose.

In our first year attempt at providing a more individualized, independent-oriented class, we made only suggested assignments. It was intended that the students would use these as a basis onto which they could add additional reading, problems, and lab work as they were individually motivated. Nothing was required, only suggested. The results were very disillusioning. No one accomplished

---

*Remarks presented at the annual meeting of the American Association of Physics Teachers, February 1-4, 1971, New York City.

anything, including the basic suggested assignment. We decided that in order for an individualized program to be successful, it was imperative to provide more definite requirements to guide the students, but from which they could easily extend and diversify. It was realized that such an individualized, diversified approach could easily lead to an unmanageable, chaotic class situation. But it was hoped that by careful planning, the teacher would be able to provide a structured learning environment organized enough to permit orderly student progress.

We decided that our structure would consist of the following: (1) specific, measurable behavioral objectives, (2) both basic and advanced required assignments, (3) tests to measure achievement of the objectives, (4) lists of school resources related to each chapter, and (5) a time table providing deadlines for minimum satisfactory progress. The objectives were chosen with the premise in mind that not all students today are inclined toward becoming physicists or engineers, but they all can benefit from and enjoy learning about physical phenomena. The statement of these objectives for each chapter of the text forced the teacher to carefully consider in advance what he felt to be the vital concepts and skills to be learned. By stating these objectives measurably in terms of desired end behavior, such as,

> "At the completion of this chapter, each student should be able to: a) use the definition of average speed, $V_{av}=\frac{d}{t}$, to find the average speed of an object, the

> total distance traveled, or the total time elapsed while the object was moving; b) find the average speed and instantaneous speed of an object by measuring the slope of a distance___versus___time graph; c) show experimentally what is meant by uniform motion; etc.,"

the teacher in essence determined both what assignments were to be given in order to achieve these objectives, and how the student was to be tested.

We began the next year with an initial familiarization with physics in a traditional class manner. After covering one introductory chapter together, we began our individualization. Each student was given a printed study guide listing objectives, assignment, and resource materials for the next chapter. When he had completed the assignment satisfactorily, he was tested and allowed to proceed to the next chapter. The teacher was available at all times to assist, but only occasionally did he make a presentation to the class as a whole. Thus, the fifty-minute period was the students', almost entirely to use as they deemed best with respect to their reading, written, and lab work.

The assignment for each chapter was of two levels--basic and advanced. The requirement for making a grade of "A" was that a student complete in a satisfactory manner the advanced assignment (marked on his assignment sheet by an asterisk) plus making a test grade of at least 80 for each chapter of the entire six units of the course. The requirement for making a grade of "B" was that a student complete in a satisfactory manner the basic assignment, plus making a grade of at least 70 for each chapter of the entire

six units of the course. The requirement for making a grade of "C" was that a student complete in a satisfactory manner the basic assignment plus making a test grade of at least 70, even if he had to take the test more than once for at least the first four units of the course. The students could work at any rate they chose, alone or in groups, and pursue any individual interests they might have as long as they completed the minimum requirements for the particular level of work they had chosen. Thus, only by completing the entire course with a high degree of proficiency could a student make an "A", while only by failing to complete a very minimal assignment could a student fail.

Testing was accomplished primarily by means of multiple choice tests over each chapter. Questions were carefully correlated to the stated objectives. By requiring each step of the work to be shown on questions involving calculations, using occasional essay questions, and occasionally asking for demonstrations, both efficient and practical testing was achieved. Students were allowed to take tests whenever they chose after satisfactorily completing their chapter assignment.

Student enthusiasm for our physics program was initially as great as their work output. Never before had I observed so much productive activity as I found occurring in our classes each day. Both high ability science students and lower ability ones were busy each day working on their individual pursuits. Some of the

other advantages we found in our approach are listed below:

I. Advantages to the student

A. Choice of level, pace, day-to-day activities, and individual or group work
B. Time at school for class work and extra projects
C. Personal contact with teacher
D. Control over grade
E. Developing sense of responsibility and self-reliance

II. Advantages to the teacher

A. Freedom from everyday lecture drudgery
B. More effective occasional lectures, films and demonstrations
C. Students aiding other students
D. Lessening of discipline problems
E. Completion of work by every student
F. No absence or make-up problems
G. Constant check on each student's progress

III. Advantages to the administration

A. Planned curriculum
B. Continuous curriculum from year to year
C. Economy of equipment costs due to requiring a smaller number of each type of apparatus
D. Increased physics enrollment leading to a more well-rounded use of science facilities

While the advantages and successes of our approach were impressive, there were several problems of substantial concern to us. The procrastination of some students, whether because of customary past experiences in school or just plain laziness, resulted in the improper assuming of responsibility for their own progress in the course. Though these students could certainly be justly failed, this was not felt to be an acceptable final solution. Another problem was the predictable unwieldiness of

such a diversified class. As the year went on, this problem became more acute. Most serious of all was the feeling expressed by a significant number of students and their parents that the students were not receiving enough in the way of teacher discourse and direction. Our conviction that any validity in such a suggestion could be remedied by improved course objectives and additional experience by both the teacher and the student in an individualized approach still left us wondering if we had yet really found that elusive, ideal combination we were seeking. Changes appeared necessary.

Our present approach seeks to combine some of the most successful elements of the traditional and individualized approaches. With the exception of a very few highly gifted and motivated students, the class now progresses through the course together at a pace prescribed by the teacher. Study guide sheets listing objectives, three levels of assignments, and related resources are given to each student at the beginning of a chapter. At least one day is set aside solely for reading. This is followed the next day by a formal presentation by the teacher introducing the material in the chapter. Several independent study days then allow each student to complete an "A", "B", or "C" level assignment in whatever fashion he chooses to go about his work. Next the whole class meets once more to discuss problems and lab work, perhaps see a film or demonstration, or hear a guest speaker. One additional independent study day allows corrections

to be made in a student's work or individual interests pursued. Finally, the chapter is concluded with a test. The test grade is averaged with the assignment grade to arrive at a chapter grade. Thus, the students are given some degree of independence but in a more definitely structured environment.

Most probably, this is still not the approach which will prove compatible enough with our philosophy and goals to be satisfactory to all of us. But every instance we observe of a student's self-achievement and enjoyment of physics insists to us that we are on the right track.